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10/551,927	10/04/2005	Atsushi Matsumoto	L9289.05182	6531

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EXAMINER	
BARON, HENRY	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/551,927	MATSUMOTO ET AL.	
	Examiner	Art Unit	
	HENRY BARON	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _04 October 2005_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-10_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-10_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _04 October 2005_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☒ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _10/4/2005_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTIONS

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> a. A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1 – 5, and 8 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art, hereafter APA, in view of in view of Fifield (U.S. Patent Application 20030128790).

3. With regards to claims 1 and 10, APA teaches a method and apparatus where a plurality of antennas that receive at mutually different timings an identical signal that includes a plurality of subcarrier signals whose frequencies differ mutually and a receiving section that performs radio reception processing in a time series on received signals of said plurality of antennas and a conversion section that performs orthogonal conversion of signals that have undergone radio reception processing in said time series, and obtains a plurality of subcarrier signals included in received signals of said plurality of antennas; (1: [0005] read to reduce the circuit scale of the receiving section i.e. a receiving apparatus, a radio receiving apparatus has been thought of that switches connection between a plurality of receiving antennas and a single receiving RF circuit i.e. a receiving section that performs radio reception processing in a time series on received signals of said plurality of antennas, by means of a switch and executes radio reception processing in a time series on signals received by all receiving antennas by means of the single receiving RF circuit and 1: [0005], read for example, FIG. 1 of Unexamined Japanese Patent Publication No. 2001-127678). Also in Figure 1. of Unexamined Japanese Patent Publication No. 2001-127678 see element 5a – 5d i.e. conversion section that performs orthogonal conversion of signals that have

undergone radio reception processing in said time series, and obtains a plurality of subcarrier signals included in received signals of said plurality of antennas.).

4. APA does not teach of a control section that performs phase rotation of a plurality of subcarrier signals included in a received signal of at least one antenna in accordance with phase rotation due to differences of reception timing of said plurality of antennas.

5. Fifield teaches these limitations. (1: [0001] read .. method of, and a receiver for, minimizing carrier phase rotation due to signal adjustments and enhancements and has particular, but not exclusive, application to overcoming the effects of small frequency offsets in a received OFDM (orthogonal frequency division multiplexed) signals. And Figure 1, element 24 control section.).

6. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the OFDM radio receiving apparatus teachings of the APA with the control section phase rotation teachings of Fifield.

7. This modification would allow received subcarrier signals to be efficiently processed using simple phase rotation circuitry and maintain the overall compact scale of circuitry in the receiver.

8. In regards to claim 2, APA modified, teaches the limitations of claim 1, including the reception timing of a first antenna, but APA does not disclose a control section that includes a channel estimation section that estimates amplitude variation and phase rotation due to a propagation path environment of the signal; and performs phase rotation of subcarrier signals in accordance with estimated phase rotation and phase rotation due to differences of reception timing of plurality of antennas.

9. FiField teaches these limitations in Figures 2 and 3 with respect to estimates amplitude variation and phase rotation and [2:0029] with reference to Figure 1.. output x(t) is applied to one input of a multiplier 22 and to a block 24 for measuring frequency offset between the transmitted and received signals . An output of the block 24 i.e. control section, comprises a correction signal c(t) which is applied to a second input of the multiplier 22. A corrected digital baseband output x.sub.adj(t) of the multiplier 22

is applied to a FFT stage 26 which converts the corrected output x.sub.adj(t) from being a time domain signal to a frequency domain signal X(t) consisting of OFDM carriers which is applied to a demodulator (DEMOD) 28 which recovers the symbol value and supplies it to an output 30. The frequency offset measuring block 24 comprises two blocks 32, 34. The block 32 serves to measure the frequency offset and the block 34 serves to generate the corrective signal c(t). The block 32 comprises a stage 36 which calculates the phase of the signal x(t), an accumulator (ACCUM) 38 for storing the frequency offsets and a stage 40 which estimates the frequency offset i.e. estimates amplitude variation and phase rotation due to a propagation path environment of said signal. The estimated frequency offset is applied to inputs 41, 43 of stages 42, 44, respectively, constituting the block 34. In the stage 42 an estimate of a symmetrical phase offset i.e. estimated phase rotation and phase rotation due to differences of reception timing of said plurality of antennas, is made and applied to the stage 44 which generates a corrective sine wave (with phase offset) to correct the estimated frequency offset applied to the input 43.).

10. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the OFDM radio receiving apparatus teachings of the APA with the control section phase rotation and channel estimation teachings of Fifield.

11. This modification would allow received subcarrier signals to be efficiently processed using simple phase rotation circuitry and maintain the overall compact scale of circuitry in the receiver.

12. In consideration of claims 3 and 4, APA modified teaches the limitations of claims 1 and 2, but APA does not disclose where the control section performs phase rotation of plurality of subcarrier signals corresponding to an antenna other than a first antenna that receives signal first among said plurality of antennas in accordance with a reception timing delay time with respect to reception timing of first antenna and where the control section holds in advance phase rotation amounts determined according to frequencies of aid plurality of subcarrier signals.

13. FiField teaches these limitations in 2: [0029] read with reference to Figure 1.. output x(t) is applied to one input of a multiplier 22 and to a block 24 for measuring frequency offset i.e. performs phase rotation of plurality of subcarrier signals, between the transmitted i.e. from the first antenna and received signals i.e. from an antenna other than a first antenna. .. An output of the block 24 i.e. control section, comprises a correction signal c(t) i.e. with a reception timing delay time with respect to reception timing of first antenna, which is applied to a second input of the multiplier 22 and 2: [0030] read the frequency offset measuring block 24 comprises two blocks 32, 34. The block 32 serves to measure the frequency offset and the block 34 serves to generate the corrective signal c(t). The block 32 comprises a stage 36 which calculates the phase of the signal x(t), an accumulator (ACCUM) 38 for storing the frequency offsets i.e. the control section holds in advance phase rotation amounts determined according to frequencies of aid plurality of subcarrier signal, and a stage 40 which estimates the frequency offset.

14. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the OFDM radio receiving apparatus teachings of the APA with the control section phase rotation and channel estimation with respect to first and second antenna teachings of Fifield.

15. This modification would allow received subcarrier signals to be efficiently processed using control section phase rotation and channel estimation with respect to first and second antenna and thus maintain the overall compact scale of circuitry in the receiver.

16. In regards to claim 5, APA teaches a radio receiving apparatus where the receiving section comprises a first switch that switches plurality of antennas; a radio reception processing section that performs radio reception processing successively on a signal output from said first switch; and a second switch that distributes a signal that has undergone radio reception processing in correspondence with an antenna that received that signal. (1: [0005], read for example, FIG. 1 of Unexamined Japanese Patent Publication No. 2001-127678 ; reference to element 2; first switch that switches plurality of antennas element 3; a radio reception processing section that performs radio reception processing successively on a

signal output from said first switch; element 3 a second switch that distributes a signal that has undergone radio reception processing in correspondence with an antenna that received that signal.).

17. Claims 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art, hereafter APA, in view of in view of Fifield (U.S. Patent Application 20030128790) and in further view of Yano et al (U.S. Patent 6,501,789)

18. With regards to claim 6, APA modified teaches the limitations of claim 1, but does not disclose a combining section that combines subcarrier signals of an identical frequency after phase rotation; and a despreading section that despreads an obtained combined signal using a spreading code identical to a spreading code used in a communicating station.

19. Fifield teaches of section that combines subcarrier signals of an identical frequency after phase rotation (1: [0029] read a corrected digital baseband output x.sub.adj(t) of the multiplier 22 is applied to a FFT stage 26 i.e. combining section that combines subcarrier signals of an identical frequency after phase rotation, which converts the corrected output x.sub.adj(t) from being a time domain signal to a frequency domain signal X(t) consisting of OFDM carriers which is applied to a demodulator (DEMOD) 28 which recovers the symbol value and supplies it to an output 30.), but does not disclose a despreading section that despreads an obtained combined signal using a spreading code identical to a spreading code used in a communicating station.

20. Yano teaches of a despreading section that despreads an obtained combined signal using a spreading code identical to a spreading code used in a communicating station. (1: [0061] read FIG. 13 shows the structure of a CDMA receiving unit for 1 channel in a CDMA receiver at a base station. …. When the direct sequence signal (DS signal) which is influenced by the multi paths are input, the searcher 2b detects the multi paths by autocorrelation using a matched filter (not shown), and inputs the timing data for starting despread and delayed time adjusting data in each path into each of the finger portions 2c.sub.1 to 2c.sub.n. A despreader 3a in the pilot channel of each of the finger portions 2c.sub.1 to

2c.sub.n subjects the direct wave or delayed wave which arrives through a predetermined path to a despread processing by using the same code as the spreading code in the pilot channel, integrates the result of the despread processing, thereafter subjects the integrated signal to a delay processing corresponding to its own path, and outputs a pilot channel signal.).

21. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the OFDM radio receiving apparatus teachings of the APA with the combiner teachings of Fifield and despreader teachings of Yano..

22. With this modification, each received subcarrier signals to be efficiently processed using control section phase rotation and combiner and, further, the subcarriers will have extra noise immunity using spreading code used in a communicating station.

23.

24. With regards to claims 8 – 9, APA, modified teaches of a generic radio receiver, but does not specifically disclose a mobile and base station comprising the radio receiving apparatus. (1: [0002] read OFDM is mainly used in digital broadcasting and WLANs (Wireless Local Area Networks and 1: [0005] read .. a radio receiving apparatus that performs diversity reception or adaptive array reception has a plurality of antennas. This kind of radio receiving apparatus has, for each receiving antenna, a receiving RF circuit that performs radio reception processing such as down-conversion and A/D (Analogue/Digital) conversion on a radio frequency (RF) signal received by the receiving antenna.)

25. Yano teaches of a mobile and base station comprising a radio receiving apparatus. (1: [0043] read FIG. 12 shows the structure of a CDMA transmitter in a mobile station… FIG. 13 shows the structure of a CDMA receiving unit for 1 channel in a CDMA receiver at a base station. A radio receiver 2a converts the frequency of the high-frequency signal received from an antenna into the frequency of baseband signals,)

26. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the teachings of APA with Yano to incorporate the generic, compact, radio receiver apparatus of claim 1 into network devices such as base stations and mobile stations.

27. This modification would enable these devices to provide MIMO OFDM reception with low power consumption and lower cost since the same circuitry is used for different devices.

28. Claims 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art, hereafter APA, in view of in view of Fifield (U.S. Patent Application 20030128790) and in further view of Yano et al (U.S. Patent 6,501,789) and in further view of Crawford (U.S. Patent Application 20030002471).

29. In regards to claim 7, APA modified teaches the limitations of claim 1, and Yano, teaches of a despreading section that despreads an obtained combined signal using a spreading code identical to a spreading code used in a communicating station. (1: [0061] read FIG. 13), however neither of these references disclose a selection section that selects a subcarrier signal corresponding to an antenna with the best reception conditions among said plurality of antennas

30. Crawford teaches the latter limitation. (1: [0013] read he method includes the steps of: receiving a burst with a system having L antenna branches and n radio frequency (RF) receivers, wherein the burst includes a diversity selection portion comprising one or more OFDM symbols that each have a frequency bin structure that includes both non-zero and zero OFDM frequency bin content; taking a first set of measurements from a first of the L antenna branches on one or more of the non-zero OFDM frequency bins; taking a second set of measurements from the first of the L antenna branches on one or more of the zero OFDM frequency bins; and computing an estimate for carrier-to-noise-plus-interference ratio (CNIR) for at least one OFDM frequency bin of the first of the L antenna branches using the first and second set of measurements i.e. a selection section that selects a subcarrier signal corresponding to an antenna with the best reception conditions among said plurality of antennas)

31. It would have been obvious at the time the invention was made by a person of to having ordinary skill in the art to modify the OFDM radio receiving apparatus teachings of the APA with the combiner teachings of Fifield and despreader teachings of Yano and the selection section teaching of Crawford.

32. With this modification, each received subcarrier signals to be efficiently processed using control section phase rotation and combiner and, further, the subcarriers will have extra noise immunity using spreading code used in a communicating station and best signal to noise ratio for subsequent demodulation from the select section.

Conclusion

33. Any inquiry concerning this communication or earlier communications from the examiner should be directed to HENRY BARON whose telephone number is (571)270-1748. The examiner can normally be reached on 7:30 AM to 5:00 PM E.S.T. Monday to Friday.

34. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on (571) 272-3174. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

35. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. B./
Examiner, Art Unit 2616

/Seema S. Rao/
Supervisory Patent Examiner, Art Unit 2616

HB